

GUIDANCE DOCUMENT FOR PREPARATION OF REMEDIAL ACTION PLANS

(Designed specifically for Petroleum Reimbursement Fund Program Eligible Sites)

1. INTRODUCTION

The preparation of a Remedial Action Plan is typically the third step in remediation of a petroleum contaminated site, normally following the initial site characterization and site investigation. Although occasionally, the initial site characterization may not be required. The RAP is intended to propose a remedial action to mitigate contaminant sources and restore groundwater quality to meet Ambient Groundwater Quality Standards (AGQS). The document will identify potential treatment technologies, evaluate the remedial options for the site, and select a remedy. The remedy chosen will be shown to be cost effective in controlling and reducing the contaminants present.

The RAP is intended to be a stand alone document. It will contain a summary of the findings of the site investigation, identifying the extent and distribution of the contamination. The conceptual hydrogeological model of the site will also be included, describing the occurrence and movement of groundwater and contamination at the site. Using this information, the RAP will develop and evaluate remedial alternatives which will address groundwater and/or soil contamination present on the site and, in some cases, indoor air quality.

The alternatives will then be evaluated based on their effectiveness, feasibility, treatment time and cost. The most cost effective alternative for the site will then be chosen and rationale provided to support that choice.

2.0 SUBMISSION SCHEDULE

The Remedial Action Plan typically will be submitted to DES within 90 days following the approval of Work Scope and Budget for the preparation of the document. The following sections provide a list of tasks which will be considered during the preparation of every Remedial Action Plan and, where applicable, will be included in the final document.

3.0 SUMMARY OF SITE CONDITIONS

The RAP will present a summary of site conditions developed during the preparation of the Site Investigation (S.I.). The summary shall include a short history of the site, the site hydrogeology, sources of contamination, and the conclusions and recommendations contained in the S.I. The distribution of the contaminants shall also be discussed. A Figure shall be included showing geologic cross sections through the site showing the water table, soil types, refusal, and limits of contaminants. A second figure shall be provided showing the aerial extent of the contamination

and isopleths of the contamination concentrations. The summary shall also present the current conceptual model of the site.

The RAP shall identify subsurface structures within 100 feet of the furthest extent of the contaminant plume. At a minimum, the RAP shall investigate the potential impact of all structures within the boundaries of the plume. Such structures include but are not limited to basements, crawl spaces, sanitary sewers, septic systems, storm drains, water, gas, electric or other utility lines.

Previous remedial actions shall be discussed such as free product recovery systems, soils excavated, and vapor mitigation efforts. These efforts should be briefly described and their effectiveness evaluated.

Other information which will be submitted as part of this section will include: copies of color photos of the site, a color copy of a U.S.G.S. Locus Map of the site, and, if available from the N.H. Department of Transportation, an aerial photograph showing the site and the surrounding area.

4.0 DEVELOPMENT OF ALTERNATIVES

Based on the hydrogeological characteristics of the site and the extent and magnitude of contamination, remedial alternatives shall be developed to reduce contaminant concentrations to levels at or below DES established limits for soil, groundwater, and indoor air. A minimum of three alternatives shall be considered to remediate the site and the associated contaminants. Should contaminated soil, groundwater, and indoor air be present, three alternatives for all three media shall be developed. One alternative for each media shall be natural attenuation or long-term monitoring. Only alternatives which would be effective at the site shall be considered.

It should be noted that natural attenuation for contaminated soils would only be effective for relatively low concentrations of contaminants, i.e., less than one order of magnitude above the Soil Cleanup Guidelines.

Alternatives which are considered only to be rejected because they are technically unsuitable shall not be presented in the RAP. For example, an alternative which called for soil vapor extraction for soil with an intrinsic permeability less than 10^{-10} cm² and contaminated with lubricating oil cannot be considered as a realistic alternative. The low permeability of the soil will restrict the movement of vapors toward a vapor extraction well and lubricating oils are not sufficiently volatile to be amenable to soil vapor extraction.

Each alternative shall provide an estimate of time necessary to achieve the cleanup goals. The time required to complete the remedial action will have a direct impact on the cost of the cleanup.

An active remedial alternative will require an initial capital investment and have higher operating costs than natural attenuation but can be expected to have a reduced cleanup time. This will affect the overall cost of the alternative evaluated.

5.0 WATER SUPPLY

Where the site and surrounding properties are served by on-lot water and the sources of the water have or may be affected by the contaminants, the RAP shall review alternatives for providing drinking water to the affected properties. These alternatives may consist of point-of-entry treatment, extension of municipal water supplies, or installation of replacement well(s). Costs shall also be developed for the water supply alternatives and compared based on their effectiveness.

Where the contaminant groundwater plume extends through existing water pipelines, either municipal or private, an evaluation shall be performed to determine the type of pipe or pipe gasket used to join the sections of the pipe together. This information will be used to assess the possibility that contaminant concentrations pose a risk of permeation of the water distribution piping. The risk is of greater concern where: piping is polyethylene, polyvinyl chloride, or chlorinated PVC; pipe gaskets are of elastic rubber materials; the rate of flow of water in the piping is low; or there are long periods where the water remains stationary in the piping.

6.0 PRELIMINARY COSTS

Preliminary costs shall be prepared for each alternative. Costs shall be developed for capital expenditures (including pilot tests, construction, equipment, land, buildings, disposal of contaminated soils, engineering, startup, and permits) and annual operating costs (including labor, materials, power, disposal of residues, monitoring, and equipment replacement). Costs shall have an accuracy of +/- 30 percent. Absolute accuracy of the cost estimate is not required.

A present worth analysis will be used to evaluate the costs that occur over different periods. The analysis discounts all future costs to the current year. This allows the cost of remedial action alternatives to be compared based on a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. For example, the present worth of a \$1,000 annual cost occurring over the next ten years would not be \$10,000 but would be less than that amount and would be dependent upon the prevailing interest rate. At 3 percent interest the present worth would drop to \$8,530. If the interest rate was increased to 5 percent, the present worth value would drop to \$7,722. If an unusually high interest rate were used, say 10 percent, the present worth would drop further to \$6,144.

In conducting the present worth analyses, assumptions must be made regarding the discount rate and the period of performance. DES recommends that a discount rate of from 2 to 5 percent after inflation be assumed. Estimates of costs in each year of operation would be made in constant dollars, representing the general purchasing power at the time of the expenditure.

7.0 COST-EFFECTIVE ANALYSIS

The alternatives are then compared for their effectiveness, feasibility or implementability, treatment time, and cost. Following the analysis of the alternatives, a recommendation is made for the most cost-effective alternative. The RAP shall contain a narrative summary evaluating the alternatives, the basis of selection, and justification, with supporting rationale, of the proposed corrective action. Recognizing that the chosen alternative will not be free of limitations, it should be the best choice for the site in question. It should be noted that the least costly alternative may not always be the most cost-effective, i.e., in some cases natural attenuation may be the least costly but could result in unacceptable risk to the public and/or the environment. However, any chosen alternative must provide a reasoned explanation for its choice other than simply stating that it is the "least expensive," "most effective," or "easiest to implement."

The recommended alternative is not chosen until after the cost-effective analysis is performed. Once the alternative is chosen, the RAP shall evaluate the needs for pilot testing of a remedial action involving treatment. Pilot testing would be used to verify assumptions made during the development of alternatives and to develop criteria to be used in preparing the final design. Occasionally pilot testing might not be required or deemed necessary. However, where the technology for the recommended alternative is new or is considered marginally or only moderately effective for the particular site, pilot testing would be required.

The RAP shall also identify needs for the installation of additional groundwater monitoring wells. The cost for the installation of those wells shall be included in the cost of the alternatives.

8.0 PRELIMINARY DESIGN

Following the selection of the remedial alternative, a preliminary design of the alternative shall be prepared. The design will present a rough layout of the equipment on a site plan also showing the arrangement of any associated piping. The plan shall be to a convenient but common engineering scale. It should be noted that the preliminary design is not to be of the detail necessary to construct the recommended facility, only to approximate the final system.

The preliminary design shall also include a process and instrumentation diagram for the process. The diagram shall show major pieces of equipment, interconnecting piping, and process instruments.

Where natural attenuation is recommended, no preliminary design is necessary.

9. COMPLIANCE SCHEDULE AND PROGRESS REPORTS

The RAP shall contain a schedule for implementing each remedial activity recommended to be undertaken as part of the selected alternative. The schedule shall be in months, projected from the commencement of the remedial design. Also to be included will be a description of the monitoring reports including monitoring locations, parameters, and frequency of monitoring.

10. LIST OF STATE, FEDERAL, AND LOCAL REGULATIONS, STATUTES, AND PERMITS REQUIRED TO IMPLEMENT THE REMEDIAL ACTION PLAN WITH AN EXPLANATION OF THE APPLICABILITY

A listing of all State, federal, and local regulations and statutes applicable to the remediation of the site shall be provided in the RAP along with an explanation of their applicability. The RAP shall also include a listing of the permits necessary to implement the recommended alternative. These permits might include air and water discharge permits, groundwater management permit, building permit, and zoning variances or special exceptions.

11.0 GROUNDWATER MANAGEMENT ZONE

The RAP shall provide the proposed delineation of the groundwater management zone. The zone shall be defined to be easily described in a deed recording. It shall be denoted by clearly identifiable boundary features unless the boundaries coincide with or parallel existing property lines. Boundary features could include stone walls, iron pipes, granite bounds, drill holes, etc. The limits of the zone will be either concurred with by DES or altered based on the extent of the contaminant plume and the levels of contamination within the plume.

The proposed GMZ shall also identify locations for additional monitoring wells to be installed.

Since DES must concur with the delineation of the GMZ, the submittal of the Groundwater Management Permit Application should not be included with the RAP. That document should be submitted only following approval of the RAP.

12. PROPOSED PERFORMANCE STANDARDS

The RAP shall specify criteria to evaluate the performance of the remedial action over time. The document will specify environmental performance standards (e.g., AGQS will be maintained at the property line), treatment system hardware performance standards (e.g., air stripper shall reduce VOC concentrations by 90% and benzene concentration in the effluent shall not exceed 5 Fg/l) and action -specific performance standards (e.g., all soil which exceeds "Risk Characterization and Management Policy" cleanup guidelines shall be excavated and treated by off-site thermal desorption). The section shall also include performance monitoring of the treatment systems installed.

13. HEALTH AND SAFETY PLAN

The Health and Safety Plan (HASP) shall be prepared to support the field activities occurring during the preparation of the RAP for the site. It must conform with the consultant's safety program and must be in compliance with 29 CFR 1910.120 OSHA. The HASP should include maps and a detailed site description, results of previous sampling activities, and field reports. The preparer should review site information, along with proposed site activities to identify potentially hazardous operations and exposures and prescribe appropriate protective measures.

14. PROJECT MANAGEMENT AND QUALITY ASSURANCE/QUALITY CONTROL

Senior personnel shall manage and supervise the preparation of the Remedial Action Plan. The project manager or senior technical staffer is expected to work with more junior level personnel in selecting appropriate remedial alternatives for the site, developing preliminary costs, and conducting the cost-effective analysis.

Quality assurance and quality control are important aspects in the preparation of a RAP. Documents should be reviewed by the senior technical staff, before submission to DES, to insure errors and inconsistencies are eliminated from the document.

15. REMEDIAL ACTION PLAN FORMAT

The following is an outline of the contents of a "typical" remedial action plan. This is offered as a guide to those preparing RAPs. It is acknowledged that differing sites may dictate either more or less information than that shown in this outline. However, the outline is intended to provide the preparer a general idea of the contents expected by DES in a complete Remedial Action Plan.

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APPENDICES

Appendix 1:	Background - Photographs of the site, aerial photographs
Appendix 2:	Investigation - Soil Characterization: Boring logs, laboratory analysis reports, chain-of-custody forms

Appendix 3: Remedial Alternatives - Include any additional information about the remedial alternatives. This may include but not be limited to: analytical tests, calculations, and/or sketches conducted to evaluate the suitability of the alternatives considered.

Appendix 4: Equipment information and/or catalogue cuts

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